EUI WORKING PAPERS

MWP 2019/09
Max Weber Programme

Dispositional Optimism (and Pessimism) and Saving Decisions

Nils Grevenbrock

European University Institute
Max Weber Programme

Dispositional Optimism (and Pessimism) and Saving Decisions

Nils Grevenbrock

EUI Working Paper **MWP** 2019/09

ISSN 1830-7728

Printed in Italy
European University Institute
Badia Fiesolana
I – 50014 San Domenico di Fiesole (FI)
Italy
www.eui.eu
cadmus.eui.eu

Abstract
In this paper I analyze the relationship between dispositional optimism (pessimism) and saving decisions. The key contribution of this paper is the use of direct psychometric measures of psychological dispositions as available in the Health and Retirement Study (HRS). Previous studies use the difference between subjective survival beliefs and objective survival probabilities as a proxy for these psychological dispositions. I argue that the proxy is not a satisfactory measure of dispositional optimism − in particular for the older population. Additionally, the psychometric measures allow me to control for optimism and pessimism separately. The psychometric measure of dispositional pessimism is shown to be significantly related to wealth holdings and stock market participation − optimism is not significantly related. A one standard deviation decrease in pessimism is associated with holding 71 US-$ more overall wealth and an increase in the likelihood of holding stocks of 2.5%.

Keywords
Household Saving Decisons, Psychological Biases, Measuring Optimism

JEL Classification: D14, D15, G11, G41, G51

This version 14 October 2019.

I would like to thank Katerina Gradeva, Alexander Ludwig and Joachim Winter for helpful discussions.

Nils Grevenbrock, Max Weber Fellow 2018-2019
European University Institute, (nils.grevenbrock@eui.eu)

1 Introduction

Dispositional optimists are defined as having a general expectation of good outcomes (Scheier and Carver, 1987; Scheier et al., 1994). Accordingly, biased beliefs in risky environments have potentially large effects on saving choices. In this paper I explore the relationship between optimism (and pessimism) and saving decisions. More specifically, I investigate whether psychological dispositions affect overall wealth accumulation and whether they affect portfolio choice decisions: the total effect of dispositional optimism (through belief distortion) on overall saving decisions is ambiguous. On the one hand, dispositional optimism potentially induces individuals to underestimate the risk of experiencing low earnings realizations. Channeled through underestimating negative earning shocks optimism leads to *under*-saving for a precautionary motive. On the other hand, however, dispositional optimism may induce individuals to overestimate their probability to survive into the future. Hence, optimism channeled through overestimating ones survival probability leads to *over*-saving for life-cycle saving motives. The overall effect of dispositional optimism (through belief distortion) on portfolio choice decisions is more unambiguous. Optimism channeled through resolving uncertainty by attaching more weight to positive outcomes leads to being more likely to invest in risky assets such as stocks.

The key contribution of this paper is the use of direct *psychometric* measures of psychological dispositions as available in the Health and Retirement Study (HRS). These psychometric measures are derived from the well-known Life Orientation Test-Revised (LOT-R), which was developed to measure dispositional optimism and pessimism (Scheier and Carver, 1987; Scheier et al., 1994). Previous studies use the difference between subjective survival beliefs (SSB) and objective survival probabilities (OSP) as a *proxy* measure of dispositional optimism (pessimism)(Puri and Robinson, 2007; Angelini and Cavapozzi, 2017). I argue that the proxy is not a satisfactory measure of dispositional optimism – in particular for the older population. I argue that simply using SSB-OSP as a proxy for dispositional optimism implies that optimism underlies strong age-effects that need to be accounted for in empirical analyses. Additionally, there is a form of truncation. The reason is that SSBs cannot be smaller than zero or larger than one. This form of truncation on average leads to overestimation for OSPs close to zero and underestimation of OSPs close to one. Age effects and the truncation effect add noise to the measure. The psychometric measure is not prone to described effects. Furthermore, it is known from the literature (Herzberg et al., 2006) that opti-

mism and pessimism show some bi-dimensionality. Using psychometric measures from the Life Orientation Test-Revised (LOT-R) allows me to separately account for optimism and pessimism. In this study I take into account that psychological dispositions might at least partially reflect personality traits. Personality traits can be thought of as ways of thinking, experiencing feelings, and behaving. In line with the by now widely established taxonomy I control for personality traits with the five-dimensional Big 5 traits: conscientiousness, extraversion, agreeableness, neuroticism, and openness to experience (McCrae and Costa, 1999).

In light of the two major savings motives – life-cycle savings and precautionary savings – my findings suggest that overall savings are reduced when households are more pessimistic, thus the life-cycle savings motive being stronger. This is robust across all specifications. On average a one standard deviation increase in pessimism is associated with holding 71 thousand US-$ less wealth. I cannot find any significant association for optimism – supporting the notion of bi-dimensionality of optimism and pessimism. Additionally, I do not find significant correlations when I use the difference between subjective survival beliefs (SSB) and objective survival probabilities (OSP) as a proxy for optimism/pessimism. This might suggest that pessimism does not affect life-cycle savings through underestimation of survival beliefs but by other factors such as the raw subjective discount factor. Of the Big 5 personality traits I find only agreeableness and neuroticism to be statistically different from zero in all specifications. More agreeable (helpful, warm, caring, softhearted, sympathetic) households hold less wealth. More neurotic individuals (moody, worried and nervous) are likely to hold more overall wealth – possibly for precautionary reasons.

Additionally, pessimism is independently and strongly associated with the likelihood of holding stocks. On average a one standard deviation decrease in pessimism is associated with a 2.5% increase in the likelihood of holding stocks. Optimism is not found to be significantly related to stock holdings. This again emphasizes that it is worthwhile to account for optimism and pessimism separately. Of the personality traits, stock market participation correlates with agreeableness only. Moreover, I cannot find the SSB-OSP measure to be significantly associated with stock market participation suggesting that pessimism (through pessimistic expectation formation) leads to less risk taking behavior.

Related Literature. This paper relates to a literature that seeks to establish a link between psychological dispositions and economic choices. Puri and Robinson (2007) and Angelini and Cavapozzi (2017) scrutinize dispositional optimism and its impact on economic choices. They proxy dispositional optimism as the difference between subjective survival beliefs as elicited in surveys and its objective counterparts based on actuarial life-tables. This paper takes up the finding of Kezdi and Willis (2014), who investigate the drivers that determine discrepancies between various objective probabilities and subjective beliefs. They conclude that the drivers behind the differences between survival expectations may be very different from the ones of other expectation differences. Therefore, using differences in expectations as a proxy for psychological dispositions is ambiguous about its real underlying (not necessarily psychological) content. In particular, with regards to survival beliefs, Grevenbrock et al. (2018) find that factors other than psychological dispositions, such as lack of cognition, are important for explaining misconceptions. Hence, this paper extends previous studies as it uses relatively new psychometric measures on psychological dispositions as measured by the LOT-R that are available in more recent waves of the HRS. Using a smaller sample of MBA students, Kaniel et al. (2009) find dispositional optimism as measured by the LOT-R to be related to various expectations about events in a labor market setting. They focus on a smaller sample of younger MBA students. Arguably, MBA students are a relatively homogenous and young group. I extend their paper by using a large-scale household survey, representative of the older US-population. This paper relates to the literature investigating the relationship between subjective survival beliefs and wealth holdings (Bloom et al., 2006; Nivakoski, 2015). Even though they do take subjective beliefs at face value and do not question its informational content, subjective survival beliefs carry a lot of psychological and cognitive information. Furthermore, as shown in Grevenbrock et al. (2018) and Binswanger and Salm (2017) cognition is important for understanding misperceiving objective probabilities. Christelis et al. (2010) show that cognitive abilities are important for portfolio choice decisions. In line with this I take into account cognitive abilities as well. Lastly, I also contribute to a more theoretical literature in economics that highlights the importance of optimism for many economic choices. For instance, Rigotti et al. (2011) show in a model that optimists tend to opt for occupations with more ambiguous returns such as entrepreneurship. While the idea that optimism (and pessimism) affects economic decisions is intuitive, there is a shortage of empirical papers providing direct evidence of this link. To the best of

my knowledge, this is the first paper to use large-scale micro data with psychometric measures in order to establish this link.
The remainder of the paper is organized as follows: Section 2 describes the dataset and variables used. Section 3 presents the empirical strategy and the results. Finally, Section 4 concludes.

2 Data Set and Variables

2.1 Health and Retirement Study (HRS)

This paper uses the Health and Retirement Study (HRS), a national representative panel study for the elderly U.S. population on a biennial basis. Interviews for the first wave were conducted in 1992. By design the interviewees are individuals older than 50 and their spouses regardless of age. The main purpose of the HRS is to contribute a rich panel data set to research on retirement, health, saving and economic well-being. Using psychometric measures induces two sample restrictions: first, questions on psychosocial dispositions started to complete the HRS since 2006 (wave 8) only. Second, psychometric measures are collected in each wave from an alternating (at random) 50% sub-sample of all core panel participants who were then visited in an enhanced face-to-face interview (EFTF). More precisely, in 2006 (wave 8) respondents received an additional questionnaire in case they were part of the first random 50% sub-sample (sub-sample A). In 2008 (wave 9), respondents who were not selected for the EFTF interview in 2006 were automatically selected in 2008 (sub-sample B). In 2010 (wave 10) respondents who had completed the EFTF interview in 2006 were again chosen to participate in this mode of data collection. As a result the first panel is available in 2010 (sub-sample A). Since wave 11 a second panel of sub-sample B is available. Overall, this study comprises waves 8(2006)-12(2014). Appendix A illustrates the samples used in the regression analyses. HRS provides sampling weights to account for selection probabilities into EFTF sub-samples and non-response rates. For each household I select the financial respondent. This person is thought to be in charge of providing answers to the financial questions of the household. All variables used in the empirical analysis are the financial respondent's variables.

2.2 Dependent Variables

I look at two different financial decisions; overall wealth holdings and stock ownership. Total wealth is defined as the sum of all components of household wealth subtracting debt and excluding social security and pension wealth. Stocks are defined as shares invested in stocks or mutual funds – exluding IRA and Keogh accounts. As some households have negative or zero wealth levels I do not take the logarithm for analysis but its level values. In some cases wealth information is missing. In that case I use imputed values as provided by RAND HRS[1]. Values in the HRS are provided in nominal dollars. I deflate nominal values to 2006 US-dollars.[2]

2.3 Explanatory Variables

2.3.1 Dispositional Optimism (Pessimism)

In this study I am investigating the effect of optimism (pessimism) on financial decisions. Additionally, I compare the results of using the psychometric measure to using a proxy measure of optimism, i.e. subjective survival beliefs - objective survival probabilities ("SSB-OSP").

Direct Psychometric Measure. From wave 8 onward, the HRS contains measures on psychosocial dispositions. Respondents are given several statements regarding various latent variables. They were asked

"Please say how much you agree or disagree with the following statements."

Measures on dispositional optimism (pessimism) are derived from the same statements as in the well-known Life Orientation Test-Revised (LOT-R) (Scheier and Carver, 1987; Scheier et al., 1994). For instance, respondents are asked to rate the statement

"In uncertain times I usually expect the best."

Each statement is rated on a scale from one (strongly disagree) to six (strongly agree). Average scores are taken to create measures for each psychological disposition, i.e. optimism and pessimism. I set the measures to missing if the response to more than one of the respective statements is missing. Coding is such that higher values for

[1] RAND HRS provides a streamlined version of the core interviews of the HRS.

[2] Data of the *Consumer Price Index - All Urban Consumers* were downloaded on *http://www.bls.gov*

the psychological disposition variables imply more optimistic, respectively, more pessimistic, dispositions. Importantly, optimism and pessimism are measured separately, i.e., respondents are asked questions with negative connotations (pessimism) or positive connotations (optimism). A full list of all statements can be found in Appendix B.

Proxy Measure. The *proxy* measure of optimism is defined as the difference between the subjective survival belief (SSB) of an individual i and its objective survival probabiliy (OSP), i.e.

$$\text{proxy. optimism} = SSB_i - OSP_i \tag{1}$$

An individual is defined to be optimistic if $SSB_i - OSP_i > 0$ and pessimistic if $SSB_i - OSP_i < 0$. Note that this measure of optimism does not allow for measuring optimism and pessimism separately. The measure is normalized to be bounded between -1 and $+1$.

Below, I describe the measurement SSBs and OSPs of an individual in more detail: In the HRS, an interviewee i of age h is asked about her SSB to live to at least a certain target age TA. I thus denote her subjective survival belief SSB as $SSB_{i,h,TA}$. The question is not asked to individuals older than 89. The target age TA depends on an individual's interview age h. The assignment of target age TA(h) to interview age h for my sample is provided in Table 1. For individuals aged 65 and older observe that the distance between interview age h and target age TA(h) is the same across all interview age/target age groups. For individuals younger than 65 the distance is longer. Additionally, in wave 8 the target age for individuals younger than 65 was different than for waves 9-12. I take into account for this change in design across waves by use of appropriate fixed effects in the regression analyses below.

For the *proxy* measure of optimism I need the objective survival probabilities (OSP) as well. In line with the literature I take the objective survival rates from (cohort) life tables for the U.S. population. One can in principle construct cohort life tables by re-arranging period life tables. The challenge is that one needs both past and future period life tables for our purpose.[3] Period life tables of the Human Mortality Database (HMD) are available until 2017 only. Future period life tables are not available but have

[3]To see this, take the following example: We want to construct a cohort life table for the ages 50-100 for a cohort born in 1960. The probability of surviving from age 60 to 61 of this cohort we can can read from the 1970-period life-table. However, the probability of surviving from age 99 to 100, must be taken from the future 2059-period life table.

Table 1: Interview Age h and Target Age TA(h)

Interview age h	Target Age (TA)	
	Wave 8	Waves 9-12
50-64	85	80
65-69	80	
70-74	85	
75-79	90	
80-84	95	
85-89	100	

Source: Health and Retirement Study (HRS). Own illustration.

to be estimated. Predictions beyond 2017 are based on an extrapolation procedure of Lee and Carter (1992). Note that period life tables are available for both males and females separately, and thus, predictions are also available for both sexes. With the cohort life table at hand I can assign an OSP to each individual in accordance with Table 1.[4]

2.3.2 Personality Traits: Big 5

Moreover, I control for the Big 5 psychological traits (McCrae and Costa, 1999). The variables underly the same data restrictions as the questions on psychological optimism and pessimism. Including these variables is thought to ensure that the measure of optimism (pessimism) does not simply reflect some other personality trait. Elicitation is slightly different than that for optimism and pessimism. Respondents are asked

"Please indicate how well each of the following statements describes you."

Possible answers to the questions ranged from *a lot* (1) to *not at all* (4). Average scores are taken to create measures for each Big 5 trait. These *Big 5* comprise *neuroticism*, *extraversion*, *agreeableness*, *conscientiousness* and *openness to experience*.[5] I set the final respective measure to missing if more than half of the questions have missing values. A full list of questions used can be found Appendix C.

[4]For birth years 1900-1932 I used data of the Social Security Administration (SSA), for later years I use data of the HMD and predictions that are based on HMD data.

[5]Generally, for all psychological/trait measures – if necessary – variables were re-coded such that for all variables higher values correspond to higher levels of a given index.

2.3.3 Further Variables

Additionally, basic socio-economic and demographic information such as sex, age, squared age are included, and whether the individual is currently working. I also include a dichotomous variable indicating whether a respondent has children or not. I add the number of children as a further control variable. I also control for total household income. It should be noted that various different sources are summarized as income. It contains wages, capital income, social benefits, etc... . Hence, some noise in the variable should be assumed. One important motive for wealth accumulation is self-insurance. For the elderly this is particularly true for health and long-term care risk. Hence, whether a household is covered by insurance or not is important. A binary variable indicating whether a respondent is covered by any form of health insurance is included. The variable takes on the value of one if the respondent is covered by any form of health insurance. I proceed the same way for whether individuals are covered by long-term care insurance. College education gives access to different and better paid jobs. The impact of education is measured by whether the respondent holds a college degree. Likewise, dichotomous indicators for being white and black is used. The variable *black (white)* is one if the respondent are black (white) and zero otherwise. Given that I control for *black* and *white* the reference group comprises individuals being non-white and non-black. Furthermore, indicator variables of whether parents are still alive or not are created capturing inter-generational wealth transmissions upon parental death. The variables are one if the respective parent is still alive and zero if the parent has deceased.

I also control for information on health (behavior). The reason is two-fold. First, I hypothesize that health has a direct effect on wealth, as being sick is associated with direct health costs and human capital loss. Secondly, controlling for health captures private information individuals might have and that is not captured by the proxy measure of optimism and pessimism. Subjective health measures indicate whether a respondent judges her health as excellent, very good, good or fair.[6] Moreover, I use binary variables based on three health indexes. The variable ADL is one if the respondent has difficulties with at least one activity of daily living.[7] The variable Mobility is one if the respondent has difficulties with at least one measure of the mobility index.[8]

[6]The reference group comprises individuals subjectively judging their health as poor.

[7]Three activities: bathing, dressing, eating

[8]Five activities: walking several blocks, walking one block, walking across the room, climbing several flights of stairs, climbing one flight of stairs.

The variable Muscle is one if the respondent has difficulties with at least one measure of the muscle index.[9] Additionally, I control for *ever have conditions*. The respondent is asked whether a certain health condition has ever been diagnosed by a doctor (eight conditions are used).[10] I build an index. Each 'yes' answer increases the index by one unit. For the waves used in the sample I do not have questions eliciting risk aversion directly. Hence, I control for variables capturing risky behavior (or the lack of healthy behavior), such as smoking and drinking. These are intended to capture subjective discounting, i.e. how strongly individuals take the future into account. Additionally, I include a variable measuring the cognitive weakness of the respondent. I do this because it is known to be important for forming probabilistic beliefs (Grevenbrock et al., 2018; Binswanger and Salm, 2017) as well as relevant for stock market investments (Christelis et al., 2010). The measure is a version of a composite score taken from RAND HRS and combines the results of several cognitive tests. For instance, respondents are asked to recall a list of random words, to count backwards and to name the (Vice) President of the United States. In total, there are 35 questions and the results are summarized in an ability score. I take RAND's composite score of cognitive ability as given and create a score of cognitive weakness. For this purpose, I subtract the cognitive ability score from the maximal achievable value, i.e., the measure of cognitive weakness is 35 minus cognitive ability. A higher score indicates higher cognitive weakness.
A summary and short description of the variables used in the analyses is depicted in Table 2 below.

2.4 Proxy vs. Psychometric Measures

For a long time, psychometric measures of optimism and pessimism have not been available in large-scale surveys. Puri and Robinson (2007) and Angelini and Cavapozzi (2017) thus measure dispositional optimism as the difference between survival beliefs and objective life-table averages. Using this measure as a proxy for dispositional optimism has been criticized for various reasons. Below, I discuss some aspects in order:
It is important to note that mortality rates as shown in period life-tables are not constant over time but have an underlying *time trend*. For this reason, Angelini and

[9] Four activities: sitting for two hours, getting up from a chair, stooping or kneeling or crouching, and pushing or pulling a large object

[10] eight items: high blood pressure, diabetes, cancer, lung disease, heart diseases, stroke, arthritis.

Table 2: Descriptive Statistics

Variable	**Description**	**Mean**	**Std. Dev.**	**Min**	**Max**
Wealth	Total wealth in 100 tsd. USD	4.437	15.039	-11.929	357.912
Stock owners.	If stock ownership	0.195	0.396	0	1
Wave 8	If wave 8	0.183	0.387	0	1
Wave 9	If wave 9	0.125	0.330	0	1
Wave 10	If wave 10	0.282	0.450	0	1
Wave 11	If wave 11	0.271	0.444	0	1
Wave 12	If wave 12	0.140	0.347	0	1
HH size	No. household members	2.296	1.418	1	14
Children	If children	0.897	0.304	0	1
No. of children	No. children	2.899	2.038	0	18
Smoke (now)	If current smoker	0.200	0.400	0	1
Smoke (ever)	If ever smoker	0.580	0.494	0	1
Drink (ever)	If ever drinker	0.557	0.497	0	1
Age	Age	64.490	9.917	50	89
$Age^2/100$	Age $^2/100$	42.573	13.592	25	79.21
Black	If black	0.167	0.373	0	1
White	If white	0.732	0.443	0	1
Male	If male	0.509	0.500	0	1
College	If college education	0.268	0.443	0	1
Working	If working	0.431	0.495	0	1
LTCI	If long-term care insur. cov.	0.102	0.302	0	1
HI	If any health insurance	0.891	0.311	0	1
HH income	Total hh. inc. in 100 tsd. USD	0.640	1.089	0	27.382
SubH: excellent	Subj. health: Excellent	0.111	0.314	0	1
SubH: very good	Subj. health: Very good	0.090	0.286	0	1
SubH: good	Subj. health: Good	0.266	0.442	0	1
SubH: fair	Subj. health: Fair	0.309	0.462	0	1
SubH: poor	Subj. health: Poor	0.224	0.417	0	1
Dad alive	If dad alive	0.112	0.315	0	1
Mom alive	If mom alive	0.261	0.439	0	1
ADL	If ADL	0.164	0.370	0	1
Mobility	If mobility	0.471	0.499	0	1
Muscle	If muscle	0.558	0.497	0	1
EhC	No. of ever have conditions	2.056	1.565	0	8
Cogn. Weakn.	Cognitive weakness	14.245	5.921	0	35
Neuroticism	Neuroticism	2.093	0.676	1	4
Extraversion	Extraversion	3.119	0.643	1.2	4
Agreeableness	Agreeableness	3.434	0.539	1	4
Conscient.	Conscientiousness	3.334	0.529	1.2	4
Openness	Openness to Experience	2.894	0.636	1	4
SSB-OSP	SSB-OSP (Lee-Carter)	-0.136	0.352	-0.775	0.967
Optimism	Optimism	4.421	1.289	1	6
Pessimism	Pessimism	2.636	1.315	1	6

Note. Descriptive Statistics of variables used in the analyses.
Source. Health and Retirement Study (HRS).

Cavapozzi (2017) extract this time trend in order to transform period life-tables into cohort life-tables. As outlined above I apply a very similar approach in this paper. Moreover, individuals might have *private (health) information* that induces them to rationally assess their survival probability to deviate from life-table average survival probabilities. Therefore, taking average life-tables might be ill-suited for the purpose of this study. Angelini and Cavapozzi (2017) approach this criticism by including health variables in their regressions. I follow this approach but use a larger set of variables.
More fundamentally however, the question is whether there are other important confounding factors explaining *SSB-OSP* that are hard to measure. In line with this, Kezdi and Willis (2014) investigate the forces that determine the discrepancies between various objective probabilities and subjective beliefs at the end of the life-cycle. They come to the conclusion that factors driving the difference between subjective and objective survival expectations may be very different from the ones driving differences in other expectations. Therefore, a study using differences in expectations as a proxy for psychological measures is actually inconclusive about its real underlying (not necessarily psychological) content. For instance, as shown in Grevenbrock et al. (2018) at older ages misconceptions are significantly driven by lack of cognition.
There might be two important *age-effects*. To see this, look at panel (a) of Figure 1. It is displayed the difference of SSBs and OSPs over age. Generally, there are discontinuities in the lines because the target age (TA) is changing over age. There are two lines for ages younger than 65 because the TA in wave 8 is different than in later waves. For wave 8 the target age is 85, and for waves 9-12 the target age is 80 for individuals younger than 65. For ages older than 64 the target age correspondences are the same in all waves, c.f. Table 1. To understand the first age effect look in panel (a) of Figure 1 at the age range older than 64 first. For this age group the SSB-OSP measure between target ages (TAs) is increasing. For ages younger than 64 this is also true for interviews conducted in wave 8. Thus, naively interpreting the difference SSB-OSP as a proxy for dispositional optimism one may conclude that dispositional optimism is increasing over age. Instead, these increases (and decreases) might be linked to the target ages asked for. Thus, in the regression analysis in Section 3.3 below I will use appropriate TA fixed effects in order to control for this potentially artificial shift in the measure between target ages. As a second age effect, there is a decrease of the measure within most target ages. For instance, observe for target age 85, i.e. ages 70-74, the SSB-OSP measure is decreasing in age. This might be explained by the fact that individuals that

are closer to their respective target age make smaller mistakes. As a result, I will also control for the distance to target ages in Section 3.3 below. Additionally, I take into account that patterns appear to be slightly different for individuals younger than 65 for which the TA-age correspondence changed after wave 8. Overall, I am left with the following variables used to control for both potentially confounding age effects: target age fixed effects, fixed effect for individuals younger than 65 and interviewed in wave 8 ($\mathcal{I}_{h<65,wave8}$), distance to interview age (TA-h), distance to interview age for individuals younger than 65 $\big($ (TA-h) $\times\ \mathcal{I}_{h<65}$ $\big)$, distance to interview age for individuals younger than 65 and interviewed in wave 8 $\big($ (TA-h) $\times\ \mathcal{I}_{h<65,wave8}$ $\big)$. Although controlling for both age effects by use of appropriate controls it might potentially add some noise in the regression analyses. Using psychometric measures dispositional optimism (pessimism) appear to be much more constant over age, c.f. panel (a) and panel (b) of Figure 1.[11][12]

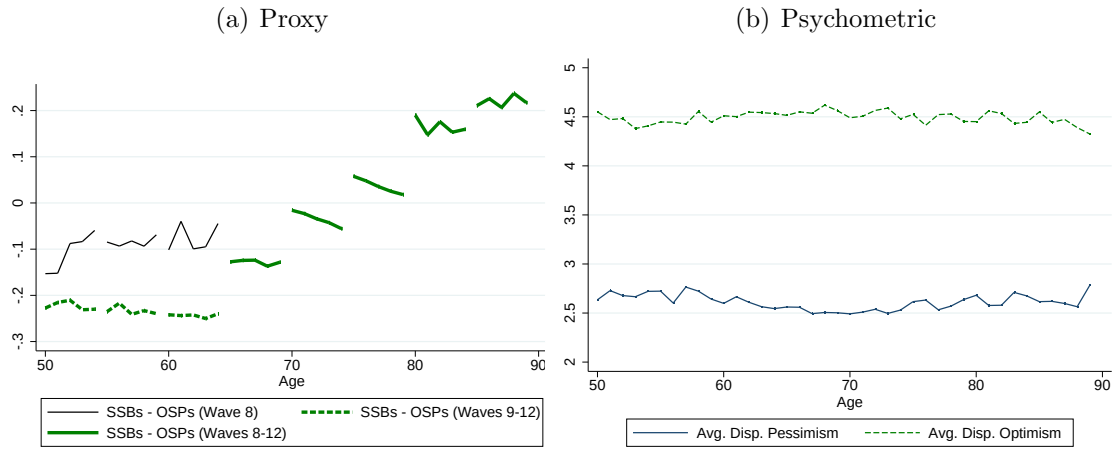
Additionally, there is a form of *truncation-effect* which might add further noise to the proxy measure. The reason is that SSBs cannot be smaller than zero or larger than one. This form of truncation on average leads to overestimation for OSPs close to zero and underestimation of OSPs close to one. To see this look at Figure 2. The figure displays a scatter plot of the empirical distribution of the "SSB-OSP" measure for each OSP level. "SSB-OSP" is bounded on an interval between zero and one if the OSP is zero, i.e. individuals can only be weakly optimistic. The boundaries of "SSB-OSP" are between minus one and zero if OSP is one, i.e. individuals can only be weakly pessimistic. It is hard to completely control for this effect empirically. The psychometric measure is not prone to described truncation effect.

Lastly, using psychometric measures allows me to control for optimism and pessimism separately. Dispositional optimism and pessimism have been found to display some *bi-dimensionality* (Herzberg et al., 2006). The correlation coefficient between

[11] The is true for the individual level as well. A short analysis exploiting the panel dimension is delegated to Appendix D

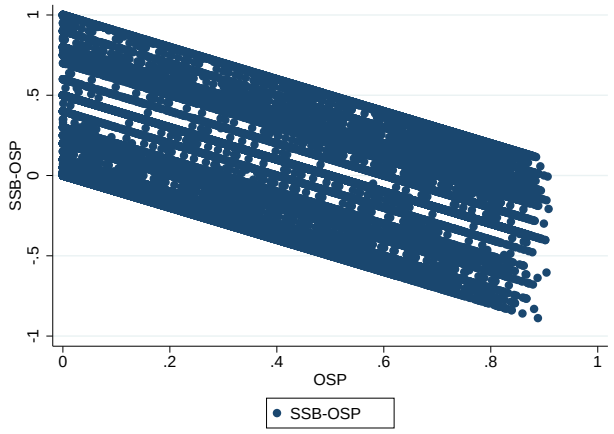
[12] The correlation coefficient of "SSB-OSP" with optimism (o) and pessimism (p) is 0.164 and -0.155 respectively. Additionally, I run two regressions in order to control for the above described age effects. For this I run two regressions that include a vector of the respective variables $\vec{u}$ (i.e. respective fixed effects and TA-h) thought to control for the confounding age effects: 1. "$SSB - OSP$" $= \beta_0 + \beta_{1,o} \times o_i + \vec{\gamma} \times \vec{u} + \epsilon_i$ and 2. "SSB-OSP" $= \beta_0 + \beta_{1,p} \times p_i + \vec{\gamma} \times \vec{u} + \epsilon_i$. The coefficients are significant and show the expected signs. However, the magnitudes ($\beta_{1,o} = 0.047$) and ($\beta_{1,p} = -0.042$) are small. For instance, a change from the minimum level of psychometric *optimism*$(= 1)$ to its maximum value is associated with an average increase in the "SSB-OSP" measure of $\beta_{1,o} \times (6 - 1) = 0.24$ – which is measured on the $[-1, 1]$-scale. This does not change when additionally including an age variable in the regression.

Figure 1: Dispositional Optimism (Pessimism) over Age: Proxy vs. Psychometric



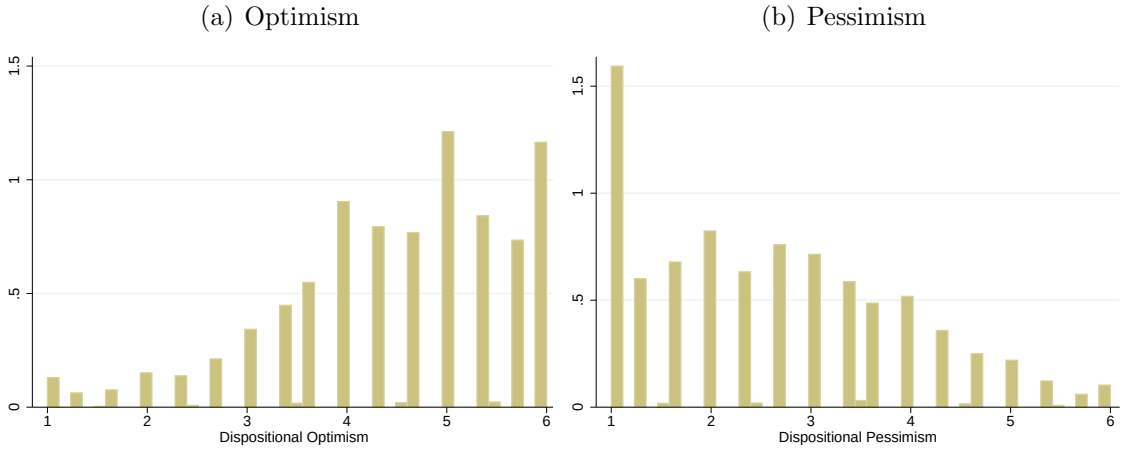
Notes: The Figure displays the proxy optimism measure in panel (a) and psychometric optimism and pessimism measures in panel (b). *Sources*: RAND HRS, own calculations

Figure 2: Proxy Measure: Truncation Effect



Notes: The Figure displays a scatter plot of the empirical distribution of the "SSB-OSP" measure for each OSP level. *Sources*: RAND HRS, own calculations

Figure 3: Psychometric Measure of Optimism (Pessimism): Bi-dimensionality



Notes: The Figure displays histograms of the psychometric measure of optimism in panel (a) and pessimism in panel (b). *Sources*: RAND HRS, own calculations

these two measures in my sample is -0.27. Given the coding of variables in case of no bi-dimensionality one would assume a correlation coefficient of -1.0. Furthermore, in Figure 3 I display the distributions of both measures. Histograms on both measures in my sample, support the notion of bi-dimensionality. Dispositional pessimism has a focal point at index value 1 (="strongly disagree"). Dispositional optimism apparently has focal point answers at values 4, 5 and 6, peaking at 5.

Since it is less noisy and it allows me to separately control for optimism and pessimism using the psychometric measure is preferred.[13] In a final step I compare my results using psychometric measures to an analysis where I use the proxy measure of optimism.

3 Results

In this paper I am interested in the relationship of dispositional optimism (pessimism) with overall wealth holdings and stock market participation.

[13]Puri and Robinson (2007) show that their proxy measure of optimism correlates well with the measures from the LOT-R. They use a sample of 80 MBA students at Duke University who are relatively young and homogeneous as compared to old individuals in the HRS.

3.1 Total Wealth

The regression used to understand the relationship between sources of optimism (pessimism) and overall wealth is specified in equation (2):

$$w_{i,t} = \beta_0 + \beta_1 o_{i,t} + \beta_2 p_{i,t} + \vec{\gamma}\vec{x}_{i,t} + \varepsilon_{i,t} \tag{2}$$

where $w_{i,t}$ describes total wealth holdings of individual i at time t, $o_{i,t}$ ($p_{i,t}$) describes optimism (pessimism) of individual i at time t, and $\vec{x}_{i,t}$ describes a vector of further control variables with a respective vector of coefficients $\vec{\gamma}$ to be estimated. $\varepsilon_{i,t}$ is the error term. For the regression analyses a model is estimated via ordinary least squares with standard errors clustered at the individual level. Regressions make use of appropiate weights as provided by HRS.

Table 3 reports the results for overall wealth holdings. The first column depicts specification (1) with neither psychological nor trait variables. In specification (2) I additionally control for dispositional optimism only. In specification I add to specification (1) a control for dispositional pessimism. In specification (4) I control for optimism and pessimism jointly. This approach is intended to detect a potential bi-dimensional effect of both psychological dispositions. In the last specification I control for both psychological dispositions and personality traits, in order to test whether psychological dispositions simply reflect personality traits.

Wealth is not significantly related to whether someone has children – at least for old ages. However, I also control for the number of children as I suspect the number of children to be important. A joint F-test of both variables reveals that they are jointly significant. The positive coefficient on *Children* may point to a positive bequest motive. The coefficient on *No. of children* might be negative as raising children is also associated with costs. Smoking is significantly different from zero and negative. Being a smoker might mean that individuals value the future less and thus accumulate less wealth. Interestingly, drinking is positively and significantly associated with wealth. One possible explanation is that mild drinking captures things like social skills that are potentially important for professional careers, and thus, are positively related to wealth accumulation. In line with this argument, note that the absolute value of the drinking coefficient decreases once accounting for personality traits. The results show that socioeconomic and demographic factors are important for explaining wealth holdings. The

two coefficients on age reveal a hump-shaped pattern on wealth holdings over age – this is relatively constant across specifications. Being white is associated with holding approximately 96-100 thousand US-$ more than the reference group – in specification (1)-(2). In specifications (3)-(5) being white is weakly significantly and positively associated with holding more wealth. Being black is negatively associated with wealth holding across all specification. However, coefficients are only weakly significant (i.e. 10%-level).[14] Being male is on average and significantly associated with holding 77-84 thousand more US-$. Being college educated has the largest significant relationship with wealth holdings and relates to holding around 300 thousand US-$ more than households with non-college educated financial respondents. Income rich households are significantly wealthier. The coefficient is statistically different from zero in all specifications at the 1%-level.

Of the insurance coefficients only the LTCI coefficient is significantly different from zero – and positive. One explanation is that wealthier individuals can afford an LTCI. For health insurance the coefficient is negative as hypothesized – but not significantly. Health status is broadly positively associated with wealth. Subjective health indicators are not significantly related to wealth holdings. The absolute values, however, have expected signs. More unhealthy households as measured by Mobility and Muscle-indicators hold significantly fewer wealth. One explanation is that they have higher health expenditures. Another reason might be that being sick is associated with less skills to acquire wealth.

Table 3: Total Wealth

	(1)	(2)	(3)	(4)	(5)
Optimism		0.1859*		0.0767	0.1496
		(0.09)		(0.08)	(0.08)
Pessimism			-0.4813***	-0.4648***	-0.5423***
			(0.08)	(0.07)	(0.08)
Neuroticism					0.9297***
					(0.20)
Extraversion					0.2443
					(0.29)
Agreeableness					-1.1520***
					(0.26)
Conscientiousness					0.5912*

Continued on next page.

[14]Note that since I control for being both white and being black, the reference group consists of individuals being non-white and non-black. If only controlling for being black, the coefficient is significantly negative from zero. Results are available upon request.

Continued from previous page.

	(1)	(2)	(3)	(4)	(5)
					(0.26)
Openness to Experience					0.5747*
					(0.27)
Cogn. Weakn.	-0.0283	-0.0253	-0.0054	-0.005	-0.0055
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
HH size	-0.0258	-0.0281	-0.014	-0.0154	0.00
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Children	0.5799	0.5679	0.5377	0.5342	0.5054
	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)
No. of children	-0.0567	-0.06	-0.056	-0.0574	-0.0487
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Smoke (now)	-0.7992***	-0.7972***	-0.7385***	-0.7397***	-0.6818**
	(0.22)	(0.22)	(0.22)	(0.22)	(0.22)
Smoke (ever)	-0.3253	-0.3205	-0.3369	-0.3345	-0.3862
	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)
Drink (ever)	1.6176***	1.6177***	1.5893***	1.5903***	1.4858***
	(0.21)	(0.21)	(0.21)	(0.21)	(0.20)
Age	0.6665***	0.6577***	0.6337***	0.6312***	0.6493***
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
$Age^2/100$	-0.4122***	-0.4074***	-0.3930***	-0.3917***	-0.3956***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Black	-0.8108*	-0.8414*	-0.9570**	-0.9647**	-0.8372*
	(0.33)	(0.34)	(0.34)	(0.34)	(0.34)
White	0.9585**	1.0020**	0.7821*	0.8061*	0.8227*
	(0.36)	(0.36)	(0.36)	(0.36)	(0.36)
Male	0.7681***	0.7833***	0.8303***	0.8345***	0.7697**
	(0.23)	(0.23)	(0.23)	(0.23)	(0.24)
College	3.0556***	3.0398***	2.9060***	2.9046***	2.7232***
	(0.40)	(0.40)	(0.40)	(0.40)	(0.39)
Working	-0.8539	-0.8652*	-0.8929*	-0.8962*	-0.8708*
	(0.44)	(0.44)	(0.44)	(0.44)	(0.44)
LTCI	1.2813***	1.2763***	1.2103***	1.2107***	1.1814***
	(0.36)	(0.36)	(0.36)	(0.36)	(0.36)
HI	-0.4994	-0.4849	-0.5581	-0.5501	-0.5341
	(0.43)	(0.44)	(0.43)	(0.43)	(0.44)
HH income	2.7245***	2.7200***	2.7062***	2.7050***	2.6804***
	(0.70)	(0.69)	(0.69)	(0.69)	(0.69)
SubH: excellent	1.1094	0.9766	0.7785	0.7351	0.878
	(0.57)	(0.58)	(0.57)	(0.57)	(0.60)
SubH: very good	0.3096	0.2181	0.0518	0.0229	0.1556
	(0.31)	(0.30)	(0.31)	(0.30)	(0.31)
SubH: good	0.1021	0.0566	-0.0534	-0.0669	0.0847
	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)
SubH: fair	-0.0671	-0.0747	-0.093	-0.0953	-0.0041
	(0.23)	(0.23)	(0.23)	(0.23)	(0.23)
Dad alive	-0.7748	-0.7498	-0.7841	-0.7734	-0.8307*
	(0.41)	(0.41)	(0.41)	(0.41)	(0.41)
Mom alive	0.0843	0.0818	0.0639	0.0635	0.0435
	(0.34)	(0.34)	(0.34)	(0.34)	(0.34)

Continued on next page.

Continued from previous page.

	(1)	(2)	(3)	(4)	(5)
ADL	0.216	0.2138	0.2476	0.2456	0.192
	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
Mobility	-0.6137**	-0.6030**	-0.5866**	-0.5831**	-0.5334*
	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)
Muscle	-0.5660*	-0.5571*	-0.5455*	-0.5425*	-0.5467*
	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)
EhC	-0.1931**	-0.1912**	-0.1853**	-0.1848**	-0.1973**
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Constant	-23.7761***	-24.2564***	-21.0379***	-21.3296***	-24.8553***
	(5.35)	(5.33)	(5.29)	(5.27)	(5.59)
N	11745	11745	11745	11745	11745
Adj. R^2	0.2106	0.2109	0.2135	0.2135	0.2176
Wave dummies	Yes	Yes	Yes	Yes	Yes
EFTF-Subsample	Yes	Yes	Yes	Yes	Yes

Note. Weighted OLS regressions.
Individual clustered standard errors in parentheses.

Cognitive weakness is not significantly different from zero in all the regressions. However, the coefficient estimates are always negative. Thus, cognitive weakness might rather be associated with fewer wealth holdings. One reason why it is hard to find the coefficient to be significantly different from zero is that ex ante the direction of the effect of cognitive weakness is ambiguous. On the one hand, less cognitively strong people may make poorer investment decisions, and thus, accumulate less wealth. This would follow a more standard logic known from empirical portfolio choice literature, c.f. Christelis et al. (2010). On the other hand, as Grevenbrock et al. (2018) show, lack of cognition is associated with overestimating ones probability to survive into the future. This would induce a positive effect on wealth holdings because people ceteris paribus want to finance a longer life span.

As mentioned above, I control for (dispositional) optimism and pessimism separately. In specification (2) I add only the control for optimism. The coefficient on optimism is positive (0.19) but only weakly different from zero (10%-level). In specification (2) I add only the control for pessimism. The coefficient on pessimism is negative (-0.48) and statistically strongly different from zero (1%-level). Including both coefficients jointly, only pessimism is significantly different from zero. The absolute size of the coefficient is almost unchanged to the size of the pessimism coefficient in specification (3), i.e. -0.47. The optimism coefficient is not significantly different from zero. Additionally the absolute size of the coefficient is less than half as large as in specification (2), i.e. to

0.08 from 0.19. This means that the pessimism variable possibly captures some of the effects of the optimism variable. However, given that the optimism coefficient is only very weakly significant in specification (2) but the coefficient on pessimism is strongly significant in specification (3) also supports the notion that optimism and pessimism as measured by the LOT-R measures capture two independent concepts rather than a single characteristic. An alternative explanation is that one of the two concepts is a more accurate measure and better controls for underlying psychological disposition. Specification (5) further controls for the *Big* 5 personality traits. The reason is that in specifications (2)-(4) it can be argued that given measures of psychological dispositions channel other personality traits. Controlling for the *Big* 5 traits in specification (5) the coefficient on pessimism is even larger in absolute terms (-0.54) – remaining highly significant ($1\% - level$). The same is true for the coefficient of optimism (0.15), however remaining insignificant. This supports a previous finding that there is a correlation between psychological dispositions and wealth holdings – independent of personality traits. In the preferred specification (5) the pessimism coefficient of -0.54 suggests that a one standard deviation increase in pessimism is associated with a decrease in wealth holdings of 71 (-0.54 $\times$ 1.315 = 0.7101) thousand US-$. In light of both saving motives – life-cycle savings and precautionary savings – this suggests that pessimism is stronger associated with factors that drive saving for life-cycle purposes than for precautionary purposes. It might be that pessimism acts through subjective survival beliefs or through a subjective raw discounting factor – both affecting intertemporal consumption/saving decisions towards an increase of consumption. In other words pessimists might be more impatient. The analysis of whether pessimism is more likely to be channeled through survival beliefs or other sources, such as raw subjective discounting, is delegated to Section 3.3.

Of the Big 5 personality traits, agreeableness is negatively associated with wealth holdings (a coefficient of -1.15). Individuals that are more helpful and caring hold less accumulated wealth. One reason might be that very agreeable persons opt for less competitive career choices that pay less. On average a one standard deviation increase in agreeableness is associated with a decrease in wealth holdings of 62 thousand US-$. Neuroticism on the contrary co-moves significantly and positively with wealth holdings. On average a one standard deviation increase of wealth holdings is associated with an increase of wealth holdings of 63 thousand US-$. Neurotic individuals are defined to be moody, worried and nervous. One possible explanation why neurotic individuals hold

more wealth is that they might have stronger precautionary savings motives. Conscientiousness and Openness to Experience are positively correlated with wealth but only weakly significant.

3.2 Participation in Stock Markets

I am interested in stock market participation in order to scrutinize whether psychological dispositions are associated with risky investment choices. I estimate a linear probability model which has the advantage of allowing for a straightforward interpretation according to equation 3:

$$s_{i,t} = \beta_0 + \beta_1 o_{i,t} + \beta_2 p_{i,t} + \beta_3 w_{i,t} + \vec{\gamma}\vec{x}_{i,t} + \varepsilon_{i,t} \tag{3}$$

where $s_{i,t}$ describes a dummy variable which is = 1 if respective household is invested in stocks and = 0 otherwise. Total wealth $w_{i,t}$, that was the dependent variable in previous regression, is now an additional explanatory variable. The vector $\vec{x}_{i,t}$ is the same as in the previous regression. Additionaly, I include an error term $\varepsilon_{i,t}$. Standard errors are clustered at the individual level. Regressions make use of appropiate weights as provided by HRS.

Table 4 reports the results. There are some differences to the previous analysis: being male is not positively and significantly associated with investing in risky assets. Wealth co-moves positively with being invested in stocks. A possible explanation can be that investing in risky assets facilitates accumulating wealth. College education is positively related to stock market participation. One explanation is that college educated people might make better informed portfolio decisions. The coefficient on cognitive weakness is now significantly negative at the 1%-level. Cognitively weak individuals have a lower probability of holding stocks. A possible reason is that they make poorer investment decisions. The optimism coefficient is basically zero in all specifications. The pessimism coefficient is significant and negative in every specification – supporting the notion that optimism is reflecting a different disposition than pessimism. Interestingly, the optimism coefficient is 0.00 and the pessimism coefficient does not change between specification (2) and (3), i.e. -0.016. This is more empirical evidence for the bi-dimensionality of both concepts. Pessimists are less likely to hold stocks – possibly because they hold less promising expectations regarding uncertain environments like the development of the stock market. Once we add the Big 5 characteristics in

specification (5) both the optimism and the pessimism coefficient increase in absolute terms (0.00 to 0.0035 and -0.016 to -0.019). This confirms previous findings of this paper that dispositional pessimism is related to financial decisions – independent of personality traits. The pessimism coefficient in the preferred specification (5) suggests that on average a one standard deviation decrease in pessimism is associated with a $2.5\%(= 1.315 \times 0.0187 = 0.02459)$ increase in the likelihood of holding stocks. Of the Big 5 personality traits, however, only agreeableness can be found to be significantly correlated with stock market participation. More agreeable persons are less likely to hold stocks. On average, being a one standard deviation more agreeable is associated with a decrease in the likelihood to hold stocks of 1.8%.

Table 4: Stock Market Participation

	(1)	(2)	(3)	(4)	(5)
Optimism		0.0038		0.000	0.0035
		(0.00)		(0.00)	(0.00)
Pessimism			-0.0163***	-0.0163***	-0.0187***
			(0.00)	(0.00)	(0.00)
Neuroticism					0.0112
					(0.01)
Extraversion					-0.0028
					(0.01)
Agreeableness					-0.0346**
					(0.01)
Conscientiousness					0.0121
					(0.01)
Openness to Experience					-0.0028
					(0.01)
Cogn. Weakn.	-0.0083***	-0.0082***	-0.0075***	-0.0075***	-0.0077***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
HH size	-0.0061	-0.0061	-0.0057	-0.0057	-0.0057
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Children	0.009	0.0087	0.0076	0.0076	0.0067
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
No. of children	-0.0090***	-0.0091***	-0.0090***	-0.0090***	-0.0090***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Smoke (now)	-0.0352*	-0.0352*	-0.0333*	-0.0333*	-0.0321*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Smoke (ever)	0.0205	0.0206	0.02	0.02	0.0195
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Drink (ever)	0.0603***	0.0604***	0.0596***	0.0596***	0.0590***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Wealth	0.0097***	0.0097***	0.0096***	0.0096***	0.0095***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age	-0.0255**	-0.0256**	-0.0265**	-0.0265**	-0.0255**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$Age^2/100$	0.0214***	0.0214***	0.0219***	0.0219***	0.0213***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Black	-0.0584**	-0.0591**	-0.0635**	-0.0635**	-0.0617**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
White	0.0341	0.035	0.0283	0.0283	0.0281
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Male	0.0152	0.0155	0.0174	0.0174	0.0117
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
College	0.1162***	0.1159***	0.1116***	0.1116***	0.1093***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Working	-0.0334*	-0.0336*	-0.0348*	-0.0348*	-0.0333*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
LTCI	0.1244***	0.1243***	0.1222***	0.1222***	0.1225***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
HI	0.1156***	0.1159***	0.1136***	0.1136***	0.1115***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)

Continued on next page.

Continued from previous page.

	(1)	(2)	(3)	(4)	(5)
HH income	0.0131*	0.0130*	0.0128*	0.0128*	0.0127*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
SubH: excellent	0.1057***	0.1030***	0.0947***	0.0946***	0.1024***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
SubH: very good	0.0609**	0.0590**	0.0522**	0.0522**	0.0576**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
SubH: good	0.0319	0.0309	0.0266	0.0266	0.0308
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
SubH: fair	0.0012	0.001	0.0003	0.0003	0.0027
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Dad alive	0.0408	0.0413	0.0404	0.0404	0.0402
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Mom alive	-0.0034	-0.0035	-0.0041	-0.0041	-0.0044
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
ADL	0.006	0.006	0.0071	0.0071	0.006
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Mobility	-0.0139	-0.0137	-0.0131	-0.0131	-0.0131
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Muscle	-0.0298*	-0.0296*	-0.0291*	-0.0291*	-0.0293*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
EhC	-0.0003	-0.0003	-0.0001	-0.0001	0.0004
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.8634**	0.8532**	0.9530**	0.9528**	0.9835**
	(0.29)	(0.29)	(0.29)	(0.29)	(0.30)
N	11745	11745	11745	11745	11745
Adj. R^2	0.194	0.194	0.196	0.196	0.197
Wave dummies	Yes	Yes	Yes	Yes	Yes
EFTF-Subsample	Yes	Yes	Yes	Yes	Yes

Note. Weighted OLS regressions.
Individual clustered standard errors in parentheses.

3.3 Comparing with Proxy Optimism ("SSB-OSP")

I redo all analyses taking the proxy measure instead of the psychometric measures for psychological dispositions. Additionally, I control for additional age effects in order to account for the design of elicitation of subjective survival beliefs as depicted in Table 1 and discussed in Section 2.4. The analysis here is thought to shed more light on understanding the SSB-OSP measure and the pessimism measure. In specification (1) I exclude cognitive weakness, health variables and Big 5 personality traits. In specification (2) I add cognitive weakness to specification (1). In specification (3) I add health variables to specification (1). In specification (4) I add both health and cognitive weakness to specification (1); and in specification (5) are added Big 5 personality

traits to specification (4). The results on wealth holdings are reported in Table 5. I cannot detect the coefficient of "SSB-OSP" to be significantly different from zero in any specification. One reason for the coefficient to be statistically insignificant might be that pessimism is affecting life-cycle decisions, however, not through subjective survival beliefs but other factors such as a raw discount factor (impatience), as discussed in the previous sub-section.[15]

The sign of the always insignificant coefficient reveals some interesting patterns: in specification (1) the "SSB-OSP" coefficient is positive (0.49), suggesting that optimists as measured by the proxy measure hold more wealth. Controlling for cognitive weakness the "SSB-OSP" coefficient remains nearly unchanged (0.48), c.f. specifications (1) and (2). Adding health variables in specification (3), however, the coefficient turns negative (-0.26). This might be a hint to the fact that optimism/pessimism according to the *proxy* measure reflects a lot of private health information. The effect of cognitive weakness on the "SSB-OSP" coefficient is relatively small when controlling for health as well, c.f. specification (3) and (4). Additionally, controlling for Big 5 personality traits in specification (5) the "SSB-OSP" coefficient remains negative but is even larger in absolute terms (-0.36). The regression results on stock market holdings reported in Table 6 reveal a very similar picture regarding the "SSB-OSP" coefficient. Note that the cognitive weakness coefficient again is highly significant, i.e. cognitive weakness is strongly associated with holding less stocks.[16]

On top of that, the "SSB-OSP" measure is likely to be relatively noisy: as outlined in Section 2.4 age-effects and a truncation-effect may only be partially accounted for.[17] Additionally, the measure does not allow us to differentiate between optimism and pessimism separately. As seen in the regressions above, optimism is hardly significant in regressions using psychometric measures either.

[15]To test that hypothesis further I ran a regression that includes both the proxy measure and the direct measures for optimism/pessimism. In all regressions pessimism is significant and negative. The SSB-OSP coefficient is never significant. Results upon request.

[16]I also ran a regression where I use the fact that when using "SSB-OSP" one can use a sample that is almost twice as large in specification (1)-(4) – since no psychometric/traits measures are used. The results are nearly unchanged. The only difference is that the "SSB-OSP" coefficient is weakly significant and positive in specification (1) and (2). In specification (3) and (4) the coefficient again turns negative. Results are available upon request.

[17]Note that one approach to account for the truncation effect might be to additionally control for the level of OSPs. I added the OSP level to specifications (5). In both regressions (overall wealth and stock market participation) the coefficient estimates are very small and not significantly different from zero. The estimate for overall wealth is 0.083 and for stock market participation it is -0.0042. All other coefficient estimates remain basically unchanged. Results upon request.

Table 5: Total Wealth: SSB-OSP

	(1)	(2)	(3)	(4)	(5)
Cogn. Weakn.		-0.0443		-0.0283	-0.0261
		(0.02)		(0.03)	(0.03)
SSB-OSP	0.4889	0.4783	-0.2593	-0.2477	-0.3545
	(0.33)	(0.33)	(0.34)	(0.34)	(0.34)
Neuroticism					0.6656**
					(0.21)
Extraversion					0.3185
					(0.31)
Agreeableness					-1.1243***
					(0.27)
Conscientiousness					0.7512**
					(0.27)
Openness to Experience					0.7188*
					(0.29)
Constant	-61.5798	-60.438	-53.8678	-53.1412	-57.1225
	(43.23)	(43.19)	(43.65)	(43.61)	(43.49)
N	11745	11745	11745	11745	11745
Adj. R^2	0.1955	0.1957	0.2005	0.2006	0.2041
Wave dummies	Yes	Yes	Yes	Yes	Yes
TA dummies	Yes	Yes	Yes	Yes	Yes
TA-h	Yes	Yes	Yes	Yes	Yes
$\mathcal{I}_{h<65,wave8}$	Yes	Yes	Yes	Yes	Yes
(TA-h) $\times$ $\mathcal{I}_{h<65}$	Yes	Yes	Yes	Yes	Yes
(TA-h) $\times$ $\mathcal{I}_{h<65,wave8}$	Yes	Yes	Yes	Yes	Yes
Health Var.	No	No	Yes	Yes	Yes
SocioDemo. Var.	Yes	Yes	Yes	Yes	Yes
EFTF-Subsample	Yes	Yes	Yes	Yes	Yes

Note. Weighted OLS regressions.
Individual clustered standard errors in parentheses.

Thus, not accounting for the underlying bi-dimensionality inherent in psychological optimism-pessimism, is likely to be a confounding factor. The reason why other papers find the "SSB-OSP" coefficient to be significant in their regressions might be twofold: First, I allow for a richer set of control variables – especially health variables. Second, the average age of the individuals of samples of previous studies is younger, possibly being less prone to the described age effect.

Table 6: Stock Market Participation: SSB-OSP

	(1)	(2)	(3)	(4)	(5)
Cogn. Weakn.		-0.0098***		-0.0087***	-0.0087***
		(0.00)		(0.00)	(0.00)
SSB-OSP	0.0222	0.0199	-0.0315	-0.0279	-0.0265
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Neuroticism					0.006
					(0.01)
Extraversion					0.0023
					(0.01)
Agreeableness					-0.0274*
					(0.01)
Conscientiousness					0.0146
					(0.01)
Openness to Experience					0.0023
					(0.01)
Constant	1.1755	1.4243	1.3425	1.5635	1.5817
	(2.43)	(2.43)	(2.40)	(2.40)	(2.40)
N	11745	11745	11745	11745	11745
Adj. R^2	0.173	0.180	0.183	0.187	0.188
Wave dummies	Yes	Yes	Yes	Yes	Yes
TA dummies	Yes	Yes	Yes	Yes	Yes
TA-h	Yes	Yes	Yes	Yes	Yes
$\mathcal{I}_{h<65,wave8}$	Yes	Yes	Yes	Yes	Yes
(TA-h) $\times$ $\mathcal{I}_{h<65}$	Yes	Yes	Yes	Yes	Yes
(TA-h) $\times$ $\mathcal{I}_{h<65,wave8}$	Yes	Yes	Yes	Yes	Yes
Health Var.	No	No	Yes	Yes	Yes
SocioDemo. Var.	Yes	Yes	Yes	Yes	Yes
EFTF-Subsample	Yes	Yes	Yes	Yes	Yes

Note. Weighted OLS regressions.
Individual clustered standard errors in parentheses.

4 Concluding Remarks

In this paper I study the relationship between dispositional optimism (pessimism) and overall wealth holdings and stock market participation. The key contribution of this paper is the use of direct *psychometric* measures which are available in the Health and Retirement Study (HRS). The psychometric measures, are based on the well-established LOT-R (Scheier and Carver, 1987; Scheier et al., 1994). Previous studies use the difference between subjective survival beliefs and objective survival probabilities as an *approximate* measure of dispositional optimism (pessimism). I argue that the proxy is not a satisfactory measure of dispositional optimism – in particular for the

older population. Furthermore, it is known from the literature (Herzberg et al., 2006) that optimism and pessimism show some bi-dimensionality. Using psychometric measures allows me to separately account for optimism and pessimism. Apart from this, in this study I take into account that psychological dispositions might at least partially reflect personality traits. Thus, the relationship between psychological dispositions and financial decisions is estimated not only controlling for a rich set of (socio-)economic, demographic, and health variables but also for personality traits.

Across all specifications I find that pessimists are more likely to hold less wealth. I find this effect to be strongest when controlling for personality traits. In light of the two savings motives – life-cycle savings and precautionary savings – this suggests that the effect through the life-cycle savings motive is stronger. On average a one standard deviation increase in pessimism is associated with holding 71 thousand US-$ less wealth. Of the Big 5 personality traits I only find agreeableness and neuroticism to be statistically different from zero in all specifications. More agreeable (helpful, warm, caring, softhearted, sympathetic) households hold less wealth. More neurotic individuals (moody, worried and nervous) are likely to hold more wealth.

Additionally, pessimism has a strong independent association with the likelihood of holding stocks. On average a one standard deviation decrease in pessimism is associated with a 2.5% increase in the likelihood of holding stocks. Of the personality traits, stock market participation correlates with agreeableness only.

Both for overall wealth holdings and stock market participation I find empirical evidence that it is important to account for optimism and pessimism separately. Differences in results might occur either due to true underlying bi-dimensionality of optimism and pessimism or due to the fact that the measure of pessimism simply is better in measuring the underlying disposition.

I redo my analysis using the difference between subjective survival beliefs and objective survival probabilities ("SSB-OSP") as a measure of optimism – in line with previous papers (Angelini and Cavapozzi, 2017; Puri and Robinson, 2007). I cannot find the coefficient to reveal a significant relationship with either wealth holdings or stock market participation. For overall wealth holdings this suggests that pessimism correlates strongly with impatience, such that the raw subjective time discount factor of pessimistic individuals might be lower. For stock market participation it appears to be likely that pessimists resolve uncertainty by attaching more weight to negative outcomes, and thus, invest less in risky assets. Additionally, is has to be concluded

that the SSB-OSP measure is likely to be noisy, and thus, it might to be hard to detect any significant relationship.

This paper establishes a link between psychological dispositions and financial decisions. I provide suggestive evidence that pessimism acts more strongly through a life-cycle savings motive than through a precautionary savings motive – at least for the older population. From an economist's perspective it would be interesting to shed more light on the channels through which optimism (pessimism) work. This would also mean extending this analysis to younger individuals. It would be interesting to see whether pessimism acts more strongly through the precautionary savings channel for younger individuals as they, arguably, face more wage risk than the individuals in my sample. More generally, it would be interesting to explore in more detail which beliefs are biased by psychological dispositions and to what extent. Empirically, this is difficult to disentangle. Individual economic savings behavior, and thus, wealth accumulation is affected, inter alia, by preferences, beliefs and institutional environments. It is already difficult to disentangle preferences, (biased) beliefs and the impact of the institutional environment. To then go one step further and even disentangle the impact of different (biased) beliefs is a daunting task – if not impossible – to achieve by means of simple regression analysis. For this a more structural analysis is required and remains for future research.

References

Angelini, V. and D. Cavapozzi (2017). Dispositinoal optimism and stock investments. *Journal of Economic Psychology* (59).

Binswanger, J. and M. Salm (2017). Does everyone use probabilities? the role of cognitive skills. *European Economic Review 98*, 73–85.

Bloom, D., D. Canning, M. Moore, and Y. Song (2006). The effect of subjective survival probabilities on retirement and wealth in the united states. *NBER Working Paper 12688*.

Christelis, D., T. Jappelli, and M. Padula (2010). Cognitive abilities and portfolio choice. *European Economic Review 54*(1), 18–31.

Grevenbrock, N., M. Groneck, A. Ludwig, and A. Zimper (2018). Cognition, optimism and the formation of age-dependent survival beliefs. *SAFE Working Paper* (200).

Herzberg, P., H. Glaesmer, and J. Hoyer (2006). Separating Optimism and Pessimism: A Robust Psychometric Analysis of the Revised Life Orientation Test (LOT-R). *Psychological Assessment 18*(4), 4338–438.

Kaniel, R., C. Massey, and D. Robinson (2009, May). The importance of being and optimist: Evidence from labor markets. Technical report, Duke University and Yale University.

Kezdi, G. and R. Willis (2014). *Expectations, Aging and Cognitive Decline*, Chapter in NBER Book 'Discoveries in Economics of Aging', pp. 305–337. University of Chicago Press.

Lee, R. and L. Carter (1992). Modeling and forecasting u.s. mortality. *Journal of the American Statistical Association 87*(419), 659 – 671.

McCrae, R. and P. Costa (1999). *A five-factor theory of personality.* New York: Guilford Press.

Nivakoski, S. (2015). Wealth and the effect of subjective survival probability. *UCD Geary Institute for Public Policy Discussion Paper Series*.

Puri, M. and D. Robinson (2007). Optimism and economic choice. *Journal of Financial Economics 86*(2007), 71–99.

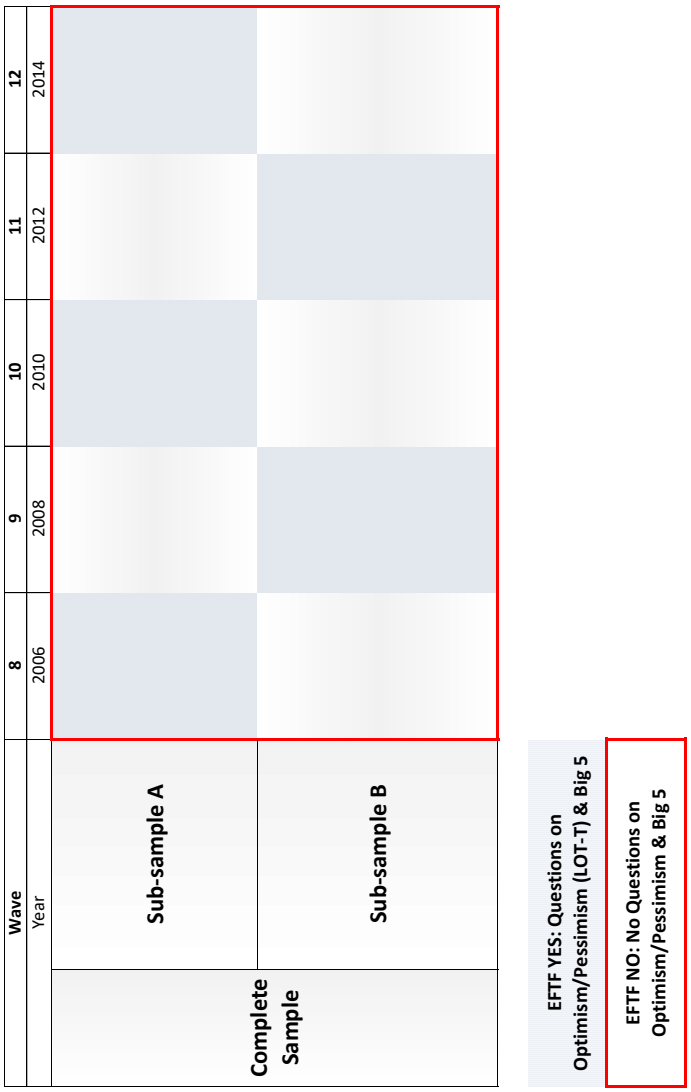
Rigotti, L., M. Ryan, and R. Vaithianathan (2011). Optimism and firm formation. *Economic Theory 46*, 1–38.

Scheier, M. and C. Carver (1987). Dispositional Optimism and Physical Well-Being: The Influence of Generalised Outcome Expectancies on Health. *Journal of Personality 55*, 169–210.

Scheier, M., C. Carver, and M. Bridges (1994). Distinguishing Optimism from Neuroticism (and Trait Anxiety, Self-Mastery, and Self-Esteem). *Journal of Personality and Psychology 57*(6), 1063–1078.

A Stylized Sample Overview

Figure 4: Stylized Overview of Samples Used in Analyses



Notes: The Figure displays the samples used in the analyses. The overall sample is split into two sub-samples. In each wave only half of the overall sample, i.e. one sub-sample, is asked questions on dispositional optimism (pessimism) and Big 5 personality traits. Thus, the green area illustrates the sample used in the analyses where psychometric measures are used. The area framed by the thick red line depicts the overall sample that is used in the analyses without psychometric measures (and Big 5 measures). *Sources*: Own illustration based on RAND HRS

B Life Orientation Test – Revised (LOT-R)

Please say how much you agree or disagree with the following statements

1=Strongly disagree, 2=Somewhat disagree, 3=Slightly disagree,
4=Slightly agree, 5=Somewhat agree 6=Strongly agree

Dispositional optimism

1. I am always optimistic about my future
2. In uncertain times I usually expect the best
3. Overall, I expect more good things to happen to me than bad

Dispositional pessimism

1. If something can go wrong it will
2. I hardly ever expect things to go my way
3. I rarely count on good things happening to me

C Personality Traits – Big 5

Please indicate how well each of the following statements describes you

1= A lot, 2=some, 3=A little, 4=Not at all

Neuroticism

1. Moody
2. Worrying
3. Nervous
4. Calm

Extraversion

1. Outgoing
2. Friendly
3. Lively
4. Active
5. Talkative

Agreeableness

1. Helpful
2. Warm
3. Caring
4. Softhearted
5. Sympathetic

Conscientiousness

1. Reckless
2. Organized
3. Responsible
4. Hardworking
5. Self-disciplined

Openness to Experience

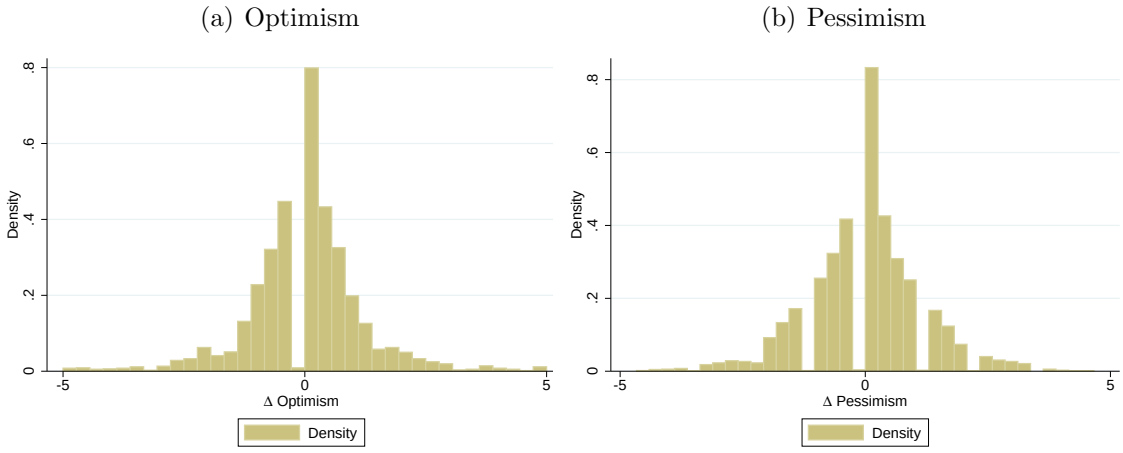
1. Creative
2. Imaginative
3. Intelligent
4. Broad-minded
5. Sophisticated
6. Adventurous

D Individual-level Changes in Dispositions

Here I display the change in individual-level dispositional measures, optimism and pessimism, over time. Note that by survey design individuals are asked the questions every two waves only. As a result the time interval between two interviews with the question is four years, c.f. Appendix A. I use only observations of those individuals for which the target age does not change between respective two interviews. As a result, given interview year j the measure is

$$\Delta\text{Disposition}_j = \text{Disposition}_j - \text{Disposition}_{j-4} \tag{4}$$

Figure 5: Change in individual-level optimism and pessimism



Notes: The Figure displays a histogram of the individual-level change of pessimism exploiting the panel dimension. Given the survey design, each individual is only asked every second wave. As a result the time span is four years. Additionally, the observations are restricted to the individuals for which the target age does not change between the two respective interview dates. *Sources*: RAND HRS, own calculations

The mean (median) change of optimism is -0.0032 (0.0000) and mean change of optimism it is -0.0269 (0.0000). I test whether the mean change is different from zero. t-values of -1.17 for change of optimism and -1.47 for change of pessimism indicate that the change at the individual level of both measures is not significantly different from zero at the 5% significance level. Thus, both measures are relatively stable on average at the individual-level – at least over a horizon of four years.